27.0 CENTRAL CALIFORNIA COAST STEELHEAD ESU

27.1 BACKGROUND

27.1.1 Description of the ESU

The Central California Coast Steelhead (CCCS) ESU includes all naturally spawned populations of steelhead in accessible river and tributary reaches within watershed basins from the Russian River (Sonoma County) to Aptos Creek, Santa Cruz County (inclusive) and the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive) in Napa County, CA. Also included in the ESU are the artificially propagated steelhead stocks (and their progeny) at the Don Clausen Fish Hatchery and the Monterey Bay Salmon and Trout Project (MBSTP) Kingfisher Flat Hatchery (BRT 2003).

27.1.2 Current Status of the ESU

The CCCS ESU was listed as a threatened species on August 18, 1997 (62 FR 43937), due to the depressed numbers of naturally produced steelhead and the number of environmental and human-caused threats to the species, including hatchery impacts, subsequent reduction of population resiliency to natural factors for decline (e.g., drought, poor ocean conditions, predation), and the lack of adequate regulatory protection to conserve the ESU. Historical ESU abundances for the Russian and San Lorenzo Rivers had been reduced by 85 percent, and many extant populations consisted of 500 fish or fewer. McEwan and Jackson (1996) noted that steelhead in most tributary streams in the San Francisco and San Pablo bays have been extirpated (62 FR 43939). More recent information includes a presence/absence compilation of steelhead in the CCCS ESU indicating that 82 percent of the sample streams held *O. mykiss* juveniles (BRT 2003). Statistical analysis conducted on the available juvenile data estimated a downward trend for five independent sites (the San Lorenzo River and Scott, Waddell, Gazos, and Redwood Creeks). CCCS ESU habitat has been impacted by the major passage barriers of Coyote and Warm Springs dams in the Russian River watershed (Busby *et al.* 1996); urban development; poor land-use management; and irrigation and water diversion impacts (BRT 2003). Assessments by the BRT of the risks faced by the ESU were divided, with 69 percent of the BRT votes being cast for "likely to be endangered," 25 percent cast for "in danger of extinction," and the remaining 6 percent cast for "neither" (BRT, 2003b). The BRT believed that artificial propagation contributed to population abundance, but members were unsure of hatchery effects on the unknown productivity, spatial structure, and diversity of the ESU.

27.2 ASSESSMENT OF THE HATCHERY PROGRAM

An inventory of all populations included in the CCCS ESU has not yet been completed. Populations that are within the boundaries of the ESU include: the Russian River, Lagunitas Creek, San Gregario Creek, Waddell Creek, Scott Creek, San Vicente Creek, the San Lorenzo River, Redwood Creek, Gazos Creek, Soquel Creek and Aptos Creek (BRT 2003). In addition, the artificially propagated steelhead stocks at Don Clausen Fish Hatchery and the MBSTP Kingfisher Flat Hatchery are considered part of the listed CCCS ESU. There are currently no

other anadromous hatchery steelhead being propagated within the CCCS ESU. The following section presents a summary of the broodstock history, similarity between hatchery-origin and natural-origin fish, program design, and program performance of these artificial propagation programs (Table 27.1).

Table 27.11. Artificial Propagation Programs which release steelhead within the geographical area of the CCCS ESU.

Program	Type	Included in ESU	Description	Production Level	Year Initiated
Don Clausen Hatchery & Coyote Valley Fish Facility	isolated	yes	yearling smolt	300,000 200,000	1981
Monterey Bay Salmon &Trout Project (Kingfisher Flat Hatchery)	integrated	yes	yearling smolt	variable	1992

27.2.1 Russian River Populations

Steelhead have been observed in the Russian River system throughout the year. Russian River steelhead populations have been severely reduced in number but appear to be fairly well distributed within the lower basin (J. Jahn, NOAA Fisheries, *pers. comm*.). Lost access to habitat above the Warm Springs and Coyote Valley dams has reduced steelhead spawning opportunity, and the basin may have been influenced by numerous out-of-basin steelhead plants from the Scott Creek and Mad River hatcheries (SSHAG 2003). There are no recent population estimates for steelhead in the Russian River, and previous estimates of 1,750 to 7,000 adults (McEwan and Jackson 1996) were based on professional judgment and extrapolation of limited data (FishPro and ENTRIX, Inc. 2004a). Recent monitoring efforts in the Russian River (snorkel surveys, electrofishing, and rotary screw trapping) confirm the presence of adult and juvenile steelhead at most study sites having riffle and cascade habitats (FishPro and ENTRIX, Inc.,2004a). A total of 6,835 steelhead (21.5 percent of the fish sampled) were captured in Santa Rosa, Millington, and Mark West creeks over a three-year study (Cook *et al.* 2002). A total of 680 YOY (young of the year) and 195 age 1+ steelhead were observed in the Sheephouse Creek sampled reach, and 230 YOY and 78 age 1+ steelhead were observed in Green Valley Creek (Cook *et al.* 2002).

27.2.1.1 Don Clausen Fish Hatchery Steelhead Program

27.2.1.1. Program History. The Russian River steelhead program began in 1981 as mitigation for the loss of habitat (and 6,000 steelhead adults) above Warm Springs Dam and was expanded to include impacts (loss of 4,000 steelhead adults) from the construction of the Coyote Valley Fish Facility (CVFF) in 1992 (FishPro and ENTRIX, Inc. 2004b). The program is funded by the Corps and managed by the California Department of Fish and Game (CDFG). As of 1998, all California hatchery steelhead stocks are 100-percent adipose fin-clipped. At that time, NOAA Fisheries requested that the DCFH steelhead be managed in an “isolated” program until genetic analysis could determine the appropriate program management strategy. The isolated program would produce fish “primarily for harvest and not (intended) for spawning in the wild or be

genetically integrated with any specific natural population." Recent microsatellite DNA analysis conducted on tissues collected from DCFH steelhead and *O. mykiss* populations above Warm Springs Dam indicates a genetic relationship between the hatchery and upper basin stocks, the latter representing the native Russian River steelhead stock prior to dam construction (C. Garza, SWFCS, *pers. comm.*). The DCFH steelhead program is being provided genetic and technical assistance by the Southwest Fisheries Science Center (SWFSC) and further supported by a multi-agency/stakeholder Technical Oversight Committee reviewing hatchery goals and management. A Hatchery and Genetic Management Plan is also being developed that will guide the adaptive management of the DCFH steelhead program.

27.2.1.1.2 Broodstock History. The DCFH hatchery stock was founded from local collections and has had few out-of-basin transfers into its broodstock. (SSHAG 2003). Fish are chosen randomly for broodstock over the course of the run and spawned at a 3:1 male-to-female ratio. Unknown numbers of natural steelhead were incorporated into the program until 2000. The program currently spawns only marked steelhead and relocates non-clipped fish into Dry Creek (SSHAG 2003). Grilse are incorporated into the broodstock at the ratio of their occurrence in adult returns to the hatchery. An average of 3,301 fish were trapped and 244 females were spawned at DCFH during broodyears 1992-2002 and an average of 1,947 steelhead trapped and 124 females spawned at CVFF during broodyears 1993-2002 (BRT 2003).

27.2.1.1.3 Similarity of Hatchery Origin to Natural Origin Fish. Based on hatchery adult returns to DCFH, the program steelhead stock follow the run and spawn timing of the natural population. Juveniles outmigrate between February and June, dependent on river flows and temperature. Adults return with the first heavy rains in November or December and continue into March or April (FishPro and ENTRIX, Inc. 2004a). The steelhead spawning period is January through April. The program is managed in "isolation", i.e., exclusive of natural broodstock. However, there is opportunity for hatchery fish to spawn naturally, resulting in a unidirectional gene flow that may impact the natural population in the future. There are no known phenotypic or biological differences between hatchery- and natural-origin steelhead.

27.2.1.1.4 Program Design. The DCFH steelhead program is designed to provide harvest opportunity for recreational fishing; there are no conservation goals attached to the program. The current production goals include 300,000 yearlings reared at the DCFH facility and annually released between December and April and 200,000 yearlings from steelhead spawned and acclimated at CVFF, but reared at DCFH. The latter fish are volitionally released between January and March (SSHAG). Adult steelhead that will be released from either DCFH and CVFF will have a hole-punch applied to the caudal fin to identify them as fish that have already returned to one of the hatchery facilities.

27.2.1.1.5 Program Performance. All program fish are 100-percent adipose fin-clipped as of 1998, affording the ability to distinguish hatchery and natural steelhead production. During the 1999-2000 spawning season, six redds of unknown steelhead origin were found in Dry Creek (CDFG 2000). Video monitoring in 2000 at Mirabel Dam in the Russian River identified 532 steelhead, of which 47 percent were hatchery steelhead, 21 percent were non-clipped, and the remaining 28 percent could not be distinguished (FishPro and ENTRIX, Inc. 2004a). Juvenile steelhead collected in screw traps during the period of 1999 to 2002 totaled 5,843 wild YOY,

250 wild smolts, and 1,825 hatchery smolts. Trapping was timed with hatchery releases. The number of natural steelhead was attributed to high tributary flows and/or migration to rearing areas in the estuary.

Adult returns averaged 2,497 to DCFH (1985-2000) and 2,255 to CVFF (1992-2000). Estimated smolt-to-adult-return (SAR) values have been made without known information on fingerling-to-yearling survival, and program harvest and stray rates are unknown (FishPro and ENTRIX, Inc. 2004b). Using values of 1, 5, and 10 percent, the SAR for DCFH and CVFF ranges from 0.1 - 2.1 percent, averaging 0.8 percent for DCFH and 1.1 percent for CVFF (FishPro and ENTRIX, Inc. 2004b).

Continued operation of the DCFH steelhead program is currently being evaluated for an Endangered Species Act-section 7 process with the Corps on the Warm Springs Project. Recent information regarding the genetic relationship of program fish with the natural populations and information from monitoring efforts will inform the considerations of changes to hatchery program goals and operation.

27.2.1.1.6 Effect on VSP

Abundance - There is limited, isolated abundance information on steelhead populations within the Russian River basin, making it difficult to assess DCFH steelhead contribution. The hatchery program is designed for steelhead harvest, and numbers of hatchery escapement are removed from the population through recreational fishing. Hatchery steelhead returning to DCFH that are not used for broodstock are relocated back into Dry Creek to enhance fishing opportunity. Hatchery juveniles and adults represent the majority of steelhead at existing monitoring sites. The majority of fish returns to DCFH are of hatchery stock, as well. Minus a fully implemented monitoring program in the Russian River basin, it can be assumed that steelhead abundance is composed primarily of hatchery fish.

Productivity - There may be contribution to natural productivity via indirect hatchery supplementation, but limited redd surveys have not included estimates of steelhead origin (CDFG 2000). CDFG surveys carried out between 1995 and 2000 identified 159 salmonid redds within 32 tributaries. Steelhead information may be teased out of the data based on typical spawn timing for Russian River salmonids, but hatchery contribution may remain unknown (FishPro and ENTRIX, Inc. 2004b).

Spatial structure - Steelhead are reportedly well distributed within the Russian River basin, and fish have been observed within several tributaries, as well as the mainstem. It is believed that increased numbers of hatchery fish provide a higher density of steelhead within the spatial structure currently present.

Diversity - Results from recent tissue analysis of DCFH steelhead and *O. mykiss* above Warm Springs Dam indicates that the hatchery stock may represent the native Russian River population prior to the construction of the dam. A more complete genetic analysis of basin populations will provide direction as to the genetic management of the hatchery stock.

27.2.2 Scott Creek Population

The Scott Creek steelhead population has long been supplemented by artificial propagation. It has been supplemented by the MBSTP for 22 years and was previously supplemented by California state hatchery activity going back to 1904.

27.2.2.1 Monterey Bay Salmon and Trout Project Steelhead Program

27.2.2.1.1 Program History. The program was designed to augment the local stocks of steelhead in the Scott Creek watershed for recreational harvest opportunity, and it includes a restoration component involving reintroduction of steelhead into streams where steelhead have been extirpated.

27.2.2.1.2 Broodstock History. There have been no out-of-basin fish transfers into the MBSTP program since its initiation in 1982. Transfers had occurred in the previous California State program, notably from the Mt. Shasta and Prairie Creek hatchery (BRT 2003). There have been no introductions since 1976, and only steelhead collected from Scott Creek have been used as program fish since 1982 (SSHAG 2003). Allozyme data places Scott Creek (and the MBSTP program fish) and the San Lorenzo and Carmell rivers together in the south of the Russian River grouping (Busby *et al.* 1996).

27.2.2.1.3 Similarity of Hatchery-origin to Natural-origin Fish. Program fish are collected from the local population, and only non-clipped steelhead are used for broodstock. The natural life history for the hatchery-origin steelhead is identical to that of natural-origin fish. There are no other data available for comparative analysis of the two groups.

27.2.2.1.4 Program Design. Broodstock fish are netted by divers in Big Creek below the Kingfisher Flat Hatchery but may also be taken throughout the Scott Creek system. Steelhead are also trapped on the San Lorenzo River in Felton. The two stocks are maintained separately at the hatchery, and both are released back into their respective native waters. An average of 98 fish, including 25 spawned females, were trapped during the 1990-1996 broodyears. Only juvenile release information (average 25,208) is available for broodyears 1989-1990. All production is adipose fin-clipped prior to release. The previous strategy of stocking the north fork of the Pajaro River with San Lorenzo fish was discontinued as of 2000 (SSHAG 2003).

27.2.2.1.5 Program Performance. Despite many years of artificial propagation in Scott Creek, there has been no corresponding monitoring to provide the information necessary to evaluate MBSTP steelhead program effects on the natural populations. Technical guidance for the program is being provided by both CDFG and NOAA Fisheries until species and habitat baselines can be established to clarify hatchery management and goals. Current MBSTP program operations allow for the capture and spawning of a conservative number of steelhead from both Scott Creek and the San Lorenzo River for education and artificial propagation purposes. Release locations in the watershed are determined by the regulatory agencies when hatchery fish are ready for release as yearling smolts.

27.2.2.1.6 Effect on VSP

Abundance - There is currently no abundance information on steelhead populations within the Russian River basin, and the contribution of DCFH steelhead to population abundance cannot be assessed. The hatchery program is designed for steelhead harvest, and numbers of hatchery escapement are removed from the population through recreational fishing. Hatchery steelhead returning to DCFH that are not utilized for broodstock are relocated back into Dry Creek to enhance fishing opportunity.

Productivity - The survival edge given to program fish by hatchery culture increases their chance to contribute to population productivity. There are no redd or spawning surveys currently being carried out in Scott Creek or the San Lorenzo River, and hatchery contribution is unknown.

Spatial structure - Benefits of hatchery supplementation to the spatial structure of steelhead populations in Scott Creek or the San Lorenzo River are not defined at this time. Spatial structure is likely supported by hatchery fish.

Diversity - Hatchery management collects a limited number of non-hatchery fish for artificial propagation from streams targeted for supplementation. The MBSTP program may influence population diversity over time; however, it is currently very conservative in hatchery production goals. Allozyme data place the Scott Creek (and MBSTP program) and San Lorenzo and Carmel rivers populations together in the south of the Russian River grouping.

27.3 CONCLUSIONS

27.4 LITERATURE CITED

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